

# HIGHWOOD BENCH

## CHOUTEAU COUNTY

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The Highwood Bench site is located approximately 10 miles northwest of Highwood at 47 41 01 N and 110 54 02 W (Site No. 18 on Map II-1). Highwood Bench is an extensive flat, sloping southeastward up to the Highwood Mountains. The monitoring site is near the top of a gentle rise where wind flow is unobstructed. Elevation at the site is 3,325 feet. This site was established by the Bureau of Reclamation as part of its Northern Great Plains Wind Energy Study. The Department of Natural Resources and Conservation assumed responsibility for the monitoring site in October 1982.

Collection of wind data began on June 5, 1981 and continued through June 17, 1983. Data from the wind sensors were recorded continuously on cassette tape at the site. These tapes were processed further by computer to yield hourly averages of wind speed, wind direction, the average cube of the hourly speed, and standard deviation of the hourly speed. In addition, the maximum and minimum instantaneous values of wind speed during each hour were recorded. Anemometer height was 10 meters above ground level.

Data recovery was poor to good, ranging from 38.7 percent in August to 81.5 percent in December. Overall data recovery based on data provided to DNRC was 68.0 percent. Actual data recovery, as reported by the Bureau of Reclamation in hard copy, was higher; however, numerous data tapes from the period between July 1982 and May 1983 were not available for re-analysis. The missing data do not appear to have greatly influenced monthly and yearly averages. When the site was decommissioned, the tail of the wind vane was

found to be badly bent downwards. Thus, the wind direction data is questionable, especially after the tail on the wind vane was bent, whenever that was.

Winds were monitored long enough to adequately represent the wind resource at the site. The data are representative of a limited area on the northwest and north-facing slopes of the Highwood Mountains.

Average annual wind speed at this site was 10.5 miles per hour. Average monthly wind speed varied from 7.4 miles per hour in August to 12.8 miles per hour in December.

Average monthly wind power ranged from 26.9 watts/m<sup>2</sup> in August to 224.9 watts/m<sup>2</sup> in December. Average annual wind power was 122.6 watts/m<sup>2</sup>.

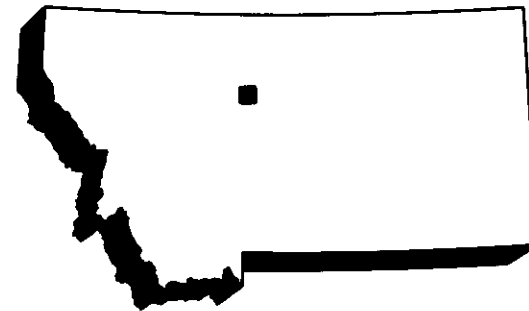


Table IV - 26  
**Monthly Wind Speed Distribution**  
**CHOUTEAU COUNTY - HIGHWOOD BENCH**  
**06/05/81 - 06/17/83**

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR	
CALM	0.4	1.6	4.2	0.0	0.0	0.6	18.5	0.0	0.0	0.0	0.0	0.6	2.4	CALM
0.1-1.0	2.1	1.4	0.7	0.0	0.2	1.5	0.3	0.0	0.2	0.3	0.5	0.6	0.7	0.1- 0.4
1.1-2.0	4.6	3.0	1.3	1.2	0.5	1.2	1.2	0.5	0.8	1.0	1.4	3.5	1.7	0.5- 0.9 S
S 2.1-3.0	3.0	3.0	3.2	1.8	1.9	2.0	2.4	1.7	2.1	1.8	2.6	3.6	2.4	1.0- 1.3 P
P 3.1-4.0	6.2	5.8	5.3	4.2	3.7	4.2	6.4	6.6	6.2	3.5	4.4	5.0	5.1	1.4- 1.8 E
E 4.1-5.0	7.1	5.3	7.0	4.8	5.5	4.6	7.0	11.1	6.9	3.3	3.3	4.8	5.7	1.9- 2.2 E
E 5.1-6.0	7.9	5.9	6.1	7.4	6.8	8.3	8.6	17.0	10.0	7.0	5.0	4.5	7.5	2.3- 2.7 D
D 6.1-7.0	7.7	4.4	7.6	6.4	5.9	7.2	6.7	12.0	7.9	6.3	5.9	4.9	6.7	2.8- 3.1
7.1-8.0	7.8	7.2	10.2	6.8	6.9	8.7	8.0	14.4	9.3	8.7	6.1	5.2	8.0	3.2- 3.6 M
M 8.1-9.0	5.1	4.5	6.8	7.1	7.2	7.5	5.8	9.9	9.4	9.1	5.3	4.7	6.8	3.7- 4.0 E
I 9.1-10.0	5.5	4.3	9.5	7.1	10.7	10.4	6.9	11.3	10.7	11.6	6.4	4.7	8.1	4.1- 4.5 T
L 10.1-11.0	3.3	5.4	6.7	5.9	7.6	9.0	6.2	8.3	9.8	7.5	5.2	4.5	6.6	4.6- 4.9 E
E 11.1-12.0	4.1	7.0	6.7	6.0	10.5	7.9	5.2	3.3	6.8	9.3	8.5	3.2	6.6	5.0- 5.4 R
S 12.1-13.0	3.4	5.2	3.3	6.4	5.8	4.8	2.7	1.7	4.1	5.0	6.7	4.1	4.6	5.5- 5.8 S
/ 13.1-14.0	4.1	6.1	1.9	5.4	6.7	4.4	1.9	0.7	4.2	3.8	8.6	5.4	4.5	5.9- 6.3 /
H 14.1-15.0	2.9	4.8	2.2	4.8	3.8	2.5	1.7	0.3	3.3	3.1	5.1	3.3	3.3	6.4- 6.7 S
O 15.1-16.0	1.5	3.5	2.3	3.7	2.7	2.1	1.4	0.3	1.6	2.7	4.5	4.5	2.7	6.8- 7.2 E
U 16.1-17.0	2.3	3.0	2.1	3.6	3.1	3.0	1.0	0.0	2.2	2.6	4.5	6.4	3.0	7.3- 7.6 C
R 17.1-18.0	1.9	1.9	1.4	2.9	1.8	2.1	1.1	0.2	0.8	1.6	2.6	3.0	1.9	7.7- 8.0 O
18.1-19.0	1.8	3.0	2.2	2.9	1.7	1.8	1.5	0.2	1.4	1.5	1.7	3.9	2.1	8.1- 8.5 N
19.1-20.0	2.6	2.5	1.7	2.1	2.1	1.3	0.9	0.0	0.4	1.1	2.6	2.0	1.6	8.6- 8.9 D
20.1-25.0	7.5	8.1	4.0	6.4	4.1	4.5	3.5	0.3	1.5	6.4	7.0	11.3	5.6	9.0-11.2
25.1-30.0	4.6	2.6	3.0	2.3	0.6	0.4	1.0	0.0	0.5	2.3	1.9	3.9	2.0	11.3-13.4
30.1-35.0	1.6	0.5	0.6	0.8	0.1	0.1	0.0	0.0	0.1	0.5	0.0	2.0	0.6	13.5-15.6
35.1-40.0	0.4	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	15.7-17.9
>40.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	>17.9
AVERAGE														
SPEED (MPH)	11.0	11.2	9.8	11.6	10.7	10.0	7.5	7.4	9.2	11.0	11.7	12.8	10.5	
AVERAGE														
SPEED (M/SEC)	4.9	5.0	4.4	5.2	4.8	4.5	3.4	3.3	4.1	4.9	5.2	5.7	4.7	
AVERAGE														
WIND POWER														
(WATTS/M**2)	194.9	153.2	117.2	144.9	96.1	85.8	62.3	26.9	63.0	121.2	135.5	224.9	122.6	
PERCENT DATA														
RECOVERY	62.7	67.9	60.9	90.6	65.1	65.0	78.2	38.7	71.0	71.0	64.4	81.5	68.0	

ANEMOMETER HEIGHT = 10 METERS = 33 FEET  
 NUMBER OF OBSERVATIONS = 12120  
 PERCENTAGE DATA RECOVERY = 68.0

SOURCE: GEORESEARCH, INC.